Study on Pulse Shapes of Alpha-ray Counter with Ionization Chamber and Linear Amplifier

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trahlung effect of the secondary electrons was also considered, and found to be small.

The final results obtained were as follows. The inner diameter of the counter was 2 cm.

wall thickness in cm	energy of γ-ray quantum 12	20	25	30	34 (mc^2)
0.65	3.2 %	8.5 %	13.3 %	18.1 %	21.3 %
0.60	3.3	8.7	13.6	18.7	22.1
0.50	3.6	9.3	14.3	19.8	23.4
0.40	3.8	9.9	14.9	20.4	23.7
0.30	4.0	10.4	15.2	20.2	23.0
0.20	4.0	10.2	14.6	18.0	20.1

46. Observation of Cosmic-rays with Photographic Emulsion. (I)

Kiichi Kimura, Senzo Tokunaga, Kazunori Yuasa and *Ryutaro Ishiwari.*

A preliminary report on the observation of cosmic-rays with photographic emulsion was described. Eight sheets of Type N. T. B. plate presented by the Eastman Kodak Co., were exposed to cosmic-rays at the meteorological observatory of Mt. Norikura (2840 m) during 47 days this summer.

Though up to now only 1⅓ plates have been scanned, 261 cosmic-ray stars and several meson and many proton tracks have been observed. The distribution of the number of prongs per star is compared with the results of Cortini et al.[1] on Testa Grigia (3500 m) and Lattes et al.[2] on Pic du Midi (2800 m) as shown in the table.

Number of prong		2	3	4	5	6	7	8	9	≧5	Total
Stars/cc/day	Norikura	10.9	16.4	15.6	9.3	2.1	0.21	0.21	0.21	12.0	55.1
	Testa Grigia		5.04	4.11	1.91						14.22
	Pic du Midi									10.5	

1) G. Cortini and A. Manfredini; Nature **163**, 991 (1949).

2) C. M. G. Lattes, G. P. C. Occhialini and C. F. Powell; Nature **160**, 453 (1947).

47. Study on Pulse Shapes of Alpha-ray Counter with Ionization Chamber and Linear Amplifier.

Yoshiaki Uemura, Ryutaro Ishiwari and *Kazunori Yuasa.*

The pulse shapes of alpha-ray counter with ionization chamber and linear

amplifier were analysed from the view of energy and work.

The ionization chamber can be regarded as a condenser, in which ions are produced by alpha-rays and carried by the electric field to the electrodes. The work to carry ions is supplied from the energy $U=\frac{1}{2}CV^2$ stored in the condenser. Then and the decrease of the energy of the condenser appears as the voltage increment of the collecting electrode of the condenser.

Now, let $dU=CVdV$ be the increment of the energy of the condenser, dU' the energy supplied from the high voltage source, and dW the work spent for carrying ions, then

$$\frac{dU}{dt}=CV\frac{dV}{dt}=\frac{dU'}{dt}-\frac{dW}{dt}$$

Thus, the fundamental differential equation of the voltage across the condenser is obtained.

Taking into account the deformation of the pulse in the coupling circuit of the amplifier, the general shape of the output pulse was calculated and formulated.

In conclusion, as an example of the application of the formula, the correction applied to the measurement of Q-value of $^{14}N(n, p)^{14}C$ reaction (This Journal, **19**, 19 (1949)) was described.

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48. Study on High Speed Rotation. (IV)

Bunsaku Arakatsu, Akira Katase, Zyun Kokame and *Syukuro Yano.*

It was reported in the previous papers* that the rotor suspended by "magnetic bearing" was electrically driven at a speed of 250,000 r. p. m. In the following experiment, when the same rotor was driven to a speed of 255,600 r. p. m., breakage of its body occured owing to its own enomorus centrifugal field and the iron shaft of this rotor was bent at the angle of about 42° by the effect of "whirling" of the shaft. The magnitude of that field was about 1.05 $\times$ 10^6 times of the gravity, and the peripheral speed was 388 m/sec.

It is necessary to make rotors as small and short as possible to prevent the the critical speed of the shaft and to attain extremely high gravitational field. To suspend such rotors stably and freely, a new "magnetic bearing" circuit of another mechanism was disgned and constructed. The initial idea of this circuit we owe MacHattie** and Beams***, Virginia Univ. Our present apparatus with several kinds of small drill rods and iron ball bearing about 5 mm in diameter has been working in good condition up to date.

* Rep. of Inst. for Chem. Res. Kyoto Univ. **17**, 88 ('49), **18**, 87 ('49), **19**, 31 ('49)

** L. E. MacHattie; Rev. Svi. Inst. **12**, 429 ('41)

*** J. W. Beams, J. L. Young, J. W. Moore; J. of App. Phys. **17**, 886 ('46)